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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/068,930	02/08/2002	Igor N. Belykh	84105WFN	9420

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Thomas H. Close
Patent Legal Staff
Eastman Kodak Company
343 State Street
Rochester, NY 14650-2201

EXAMINER	
KRONENTHAL, CRAIG W	

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 02/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/068,930	BELYKH ET AL.	
	Examiner	Art Unit	
	Craig W Kronenthal	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1,2,9-13 and 16-20* is/are rejected.

7)☐ Claim(s) *3-8,14 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/8/02*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 2/08/2002 fails to comply with 37 CFR 1.98(a)(2), which requires that a copy of each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

The information disclosure statement filed 2/08/2002 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56. It has been placed in the application file, but the information referred to therein has not been considered. The relevant information of each text book should be specified. For example, page numbers with appropriate information should be provided.

Claim Objections

Claim 1 is objected to because of the following informalities:

- On line 6 of claim 1, "has a grid" should be replaced with "has grid".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 9, 10, 12, 13, and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yazici et al. (PN 6,333,990) (hereinafter Yazici) in view of Hamming ("Digital filters" referred to in the provided IDS dated 2/8/02).

Regarding Claim 1: Yazici discloses a method for detecting and attenuating grid artifacts (grid line artifacts, col. 2, line 58) in a digital radiographic image comprising:

- Providing an input digital radiographic image (col. 2 lines 48-49). [The x-ray image formed from the results of the detectors (Fig. 1, 130) is the input digital radiographic image.]
- Processing said input digital radiographic image with a detection algorithm based on 2-D dynamic correlation in both spatial and frequency domains to determine whether said input digital radiographic image has grid artifacts (col. 3 lines 1-12). [The removing method includes the detection of grid line artifacts based on a 2-D dynamic correlation in the spatial domain in steps 212 (Fig. 2)/266 (Fig. 3) and 214 (Fig. 2)/264 (Fig. 3). The 2-D dynamic correlation is represented by the comparison of a histogram of the gradient image with a threshold "T" (col. 4 lines 30-32). Also in the spatial domain, another 2-D dynamic correlation takes place

between the image and an intensity threshold "I" (col. 4 lines 38-39). A 2-D correlation is also done in the frequency domain (col. 6 lines 1-5).]

- Designing a frequency bandstop (notch) digital 1-D filter (col. 5 lines 41-56). [It is inherent that a notch filter be used for the process of reducing spectral component magnitudes within a desired range. It is understood that the range 390 like the range 380 is designed as a function of the spectral component representing the grid line artifact.]
- Suppressing said grid artifacts by further processing said input digital radiographic image with said designed filter to produce an output digital radiographic image of improved image quality (col. 5 lines 62-65). [The spectral components of range 390 in Figure 8 are the result of applying a notch filter to the range 390 of Figure 7. It is clear from the figures that the new grid line spectral component (Fig. 8, 381) is a suppressed version of the original grid line spectral component (Fig. 7, 380).]

Although Yazici teaches an adaptive notch filter, Yazici does not disclose the detecting of the grid orientation, frequency, and signal-to-noise ratio of the grid artifacts or the designing of the notch filter as a function of the grid frequency and attenuation level. However, based on the admitted prior art (p. 4, [0049], lines 1-8) it is understood that Hamming's "Digital filters" discloses the use of orientation, frequency, and signal-to-noise ratio in designing a notch filter. Therefore, it would be obvious to one of ordinary skill to use these grid parameters to design the adaptive notch filter as used in Yazici

who wishes to remove grid line artifacts. Furthermore, one would be motivated to make this modification to determine ranges 388 and 390.

The analogous arguments made regarding claim 1 are applicable to claims 16-20.

Regarding Claim 2: Yazici as modified by Hamming discloses the method of claim 1 wherein said processing includes consequent dynamic analyzing image profiles in two dimensions both in spatial and in frequency domains in a predefined square sub-region of the input digital radiographic image (window) in each of horizontal and vertical directions. [Yazici teaches the dividing of an x-ray image into N windows (Fig. 2, 210) which reads on analyzing image profiles in a predefined square sub-region (col. 3 lines 16-18). Analyzing image profiles is achieved in the correlation processes in both the spatial and frequency domains (see the analogous arguments made regarding claim 1). The x-ray image is a two dimensional image and therefore a complete correlation of the image with a threshold would require analyzing the profiles in both the horizontal and vertical directions. In the frequency domain, specifically the Fourier domain, the x-axis and y-axis are representative of the horizontal and vertical directions.]

Regarding Claim 9: Yazici as modified by Hamming discloses the method of claim 1, but does not disclose calculating the notch filter coefficients. However, the examiner takes official notice that it is well known in the art that when designing a notch for use in a frequency domain, like the Fourier domain, notch coefficients are calculated.

Regarding Claim 10: Yazici as modified by Hamming discloses the method of claim 1, but does not disclose the calculating of finite impulse response notch filter coefficients. The analogous arguments regarding claim 9 are also applicable to claim 10. Furthermore, the examiner takes official notice that it is also well known in the art that the notch coefficients calculated would be finite impulse response notch filter coefficients. All filters made of use are defined by a discrete number of coefficients, wherein each coefficient represents the magnitudes of an impulse response.

Regarding Claim 12: Yazici as modified by Hamming discloses the method of claim 1. Yazici further discloses the method wherein said suppressing includes a pre-convolution procedure (Fig. 2, 212 and 214), a fast convolution procedure (Fig. 2, 216), and a post-convolution procedure (Fig. 2, 218). [The replacing of edgy regions (212) and high intensity regions (214) are the pre-convolution procedures (col. 3 lines 4-8). The fast convolution is represented by the Fast Fourier Transformation (FFT) (216) to remove the grid line artifacts (col. 3 lines 8-10). The inverse Fourier transform (218) is the post-convolution process (col. 3 lines 10-12).]

Regarding Claim 13: Yazici as modified by Hamming discloses the method of claim 12. Yazici further discloses the method wherein said pre-convolution (Fig. 2, 212 and 214) and post-convolution (Fig. 2, 218) procedures include using a spike effect elimination function and an edge effect elimination function (col. 3 lines 4-8). [The pre-convolution procedure includes both the replacing of edgy regions with non-edgy regions (212) and

the replacing of high intensity regions with low intensity regions (214). The replacing of edgy regions (212) represents the edge effect elimination function. The replacing of high intensity regions (214) represents the spike effect elimination function. Both are performed in the pre-convolution process which reads the limitations of the claim language.]

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yazici in view of Hamming as applied to claim 1 above, and further in view of Potter ("Compilation of time windows and time shapes for Fourier analysis" referred to in the provided IDS dated 2/08/02).

Regarding Claim 11: Yazici in view of Hamming and modified with finite impulse response notch filter coefficients discloses the method of claim 10. This modification does not include the use of a trigonometric trapezoidal filter algorithm with a smoothing window. However, the admitted prior art discloses calculating finite impulse response notch filter coefficients including using a trigonometric trapezoid filter algorithm with Potter P310 smoothing window (p. 4, [0050], lines 1-6). It has been admitted that Potter R.W. in "Compilation of time windows and time shapes for Fourier analysis" provides obviousness and motivation for this modification by proposing the calculating procedure as being one of the best candidates.

Allowable Subject Matter

Claims 3-8, 14, and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Heuscher (PN 5,276,614) is cited for teaching the use of adaptive notch filters in digital medical image processing.
- Yamada (PN 6,587,594) is cited for teaching a moiré eliminating filter.
- Ishimitsu (5,881,162) is cited for teaching an image reading apparatus capable of eliminating moiré on images including the computation of SNR and adaptive filtering.
- Shu et al. (PN 6,233,060) is cited for teaching the reduction of moiré in screened images by first performing edge detection and then utilizing an adaptive filter.
- Floyd, Jr. et al. (5,440,647) is cited for teaching an x-ray procedure for removing scattered radiation and enhancing SNR.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig W Kronenthal whose telephone number is (703) 305-8696. The examiner can normally be reached on 8:00 am - 5:00 pm / Mon. - Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 306-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

02/02/05
CWK

MAHRDAD DASTOURI
PRIMARY EXAMINER

Mahrdad Dastouri